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**ARAC WG Report****Report from the Flight Test Harmonization Working Group****Rule Section: FAR/JAR 25.111(c)(4)**

What is the underlying safety issue addressed by the FAR/JAR?: This requirement sets forth the definition of the takeoff path, which is used to comply with certain airworthiness and operating limitations. Section/JAR 25.111(c)(4), which is the only paragraph that is different between the FAR and JAR, allows only certain routine crew actions to be made before the airplane reaches a height of 400 feet above the takeoff surface. Simulation studies and accident investigations have shown that during periods of high workload, as with an engine failure during takeoff, the crew might not take actions such as advancing the power levers on the operating engine(s), even if the crew knows that the operating engine(s) are not at their maximum power setting. Credit can be taken for retracting the landing gear, however, as this is accomplished routinely once a positive rate of climb is observed.

What are the current FAR and JAR standards?: see below

Current FAR text: § 25.111(c)(4): Except for gear retraction and propeller feathering, the airplane configuration may not be changed, and no change in power or thrust that requires action by the pilot may be made, until the airplane is 400 feet above the takeoff surface.

Current JAR text: JAR 25.111(c)(4): Except for gear retraction and automatic propeller feathering, the aeroplane configuration may not be changed, and no change in power or thrust that requires action by the pilot may be made, until the aeroplane is 400 feet above the takeoff surface.

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What are the differences in the standards and what do these differences result in?: The standards are the same except for §/JAR 25.111(c)(4). Although both standards allow credit in §/JAR 25.111(c)(4) for propeller feathering before the airplane is 400 feet above the takeoff surface, the JAR standard explicitly limits this credit to **automatic** propeller feathering. The JAR standard does not allow credit for manual propeller feathering until the airplane is at least 400 feet above the takeoff surface.

FAA policy has been in accordance with the JAR standard. Only automatic propeller feathering has been accepted as complying with the intent of § 25.111(c)(4).

## RPR # ANM-00-226-A

What, if any, are the differences in the means of compliance?:

The means of compliance are the same, except for the following 2 JAA ACJ's.

ACJ 25.111

The height references in JAR 25.111 should be interpreted as geometrical heights.

ACJ 25.111(b):

- 2 The time between lift-off and the initiation of gear retraction should be not less than 3 seconds and may need to be longer than 3 seconds if, on a particular aeroplane type, a longer delay is found to be appropriate.

There is no FAA equivalent to ACJ 25.111. The FAA equivalent to ACJ 25.111(b) No. 2 is paragraph 12e(2) of AC 25-7A:

(2) Procedures. The time between liftoff and initiation of gear retraction should not be less than that necessary to establish an indicated positive rate of climb plus one second.

What is the proposed action?: Codify current FAA policy by harmonizing to the JAR standard.

What should the harmonized standard be?: see below

Proposed text of harmonized standard:

FAR/JAR 25.111(c)(4): Except for gear retraction and automatic propeller feathering, the airplane configuration may not be changed, and no change in power or thrust that requires action by the pilot may be made, until the airplane is 400 feet above the takeoff surface.

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How does this proposed standard address the underlying safety issue?: It continues to address the underlying safety issue in the same manner by codifying current FAA policy to harmonize with the JAR.

Relative to the current FAR, does the proposed standard increase, decrease, or maintain the same level of safety?: Maintain. In AC 25-7A, it is noted that propeller feathering before the airplane reaches a height of 400 feet must be automatic in order to receive credit for its effect on the flight path.

Relative to current industry practice, does the proposed standard increase, decrease, or maintain the same level of safety?: Maintain.

## RPR # ANM-00-226-A

What other options have been considered and why were they not selected?: This item was proposed as an enveloping item. No other options were considered.

Who would be affected by the proposed change?: Manufacturers and operators of transport category airplanes could be affected by the proposed change; however, there will be no effect as it codifies current practices and policy.

To ensure harmonization, what current advisory material (e.g., ACJ, AMJ, AC, policy letters) needs to be included in the rule text or preamble?: None.

Is existing FAA advisory material adequate? (If not, what advisory material should be adopted?): Revise AC 25-7A as follows:

Add a new paragraph 12a(1)(iii) to read as follows:

(iii) The height references in § 25.111 should be interpreted as geometrical heights.

Revise paragraph 12e(2) to read as follows:

(2) Procedures. The time between liftoff and the initiation of gear retraction during takeoff distance demonstrations should not be less than that necessary to establish an indicated positive rate of climb plus one second. For the purposes of flight manual expansion, the average demonstrated time delay between liftoff and initiation of gear retraction may be assumed; however, this value should not be less than 3 seconds.

How does the proposed standard compare to the current ICAO standards?: The proposed standard is consistent with the ICAO standards, which are not specific in this area.

Does the proposed standard affect other harmonization working groups?: No.

What is the cost impact of complying with the proposed standard?: None.

Does the working group want to review the draft NPRM prior to publication in the Federal Register?: Yes.

In light of the information provided in this report, does the HWG consider that the "Fast Track" process is appropriate for this rulemaking project, or is the project too complex or controversial for the Fast Track Process. Explain: Yes, the "Fast Track" process is appropriate for this project. The project is neither too complex nor too controversial to use the "Fast Track" process.

# RPR # ANM-00-226-A

## ARAC WG Report

### Report from the Flight Test Harmonization Working Group

#### Rule Section: FAR/JAR 25.147(c)(2)

What is the underlying safety issue addressed by the FAR/JAR?: This requirement is part of FAR/JAR 25.147(c), which addresses controllability in the one-engine-inoperative condition. It requires that transport category airplanes be controllable and maneuverable with the critical engine inoperative.

What are the current FAR and JAR standards?: see below

Current FAR text: none

Current JAR text: With the critical engine inoperative, roll response must allow normal manoeuvres. Lateral control must be sufficient, at the speeds likely to be used with one engine inoperative for climb, cruise, descent and landing approach, to provide a peak roll rate necessary for safety without excessive control forces or travel. (See ACJ 25.147(c)(2).)

What are the differences in the standards and what do these differences result in?: In addition to the minimum bank angle capability at  $1.4 V_s$  prescribed by FAR/JAR 25.147(c), JAR 25.147(c)(2) addresses roll rate. Roll rate response must be evaluated and found adequate for all speeds likely to be used with one engine inoperative for climb, cruise, descent, and landing approach. Also, control forces and control travel must not be excessive.

Additional flight testing is needed to show compliance with the JAR requirement. Since industry practice is to comply with both standards, it is difficult to determine whether there are any resulting design differences. It is not known if the differences in the standards would have resulted in any design differences had current industry practice not been to comply with both standards.

What, if any, are the differences in the means of compliance?: The FAR does not prescribe any roll rate requirements. Any evaluation of roll rate would be only of a general qualitative nature relative to the ease of performing the banked turns required by § 25.147(c). Also, the FAR evaluation is only performed at  $1.4 V_s$ . Control forces for the 20 degree banked turn maneuver of § 25.147(c) would be subject to the requirements of § 25.143(c).

The JAR means of compliance is given by ACJ 25.147(c)(2):

JAR ACJ 25.147(c)(2) Lateral Control: One Engine Inoperative (Interpretative Material)

## RPR # ANM-00-226-A

An acceptable method of demonstrating compliance with JAR 25.147(c)(2) is as follows:

It should be possible in the conditions specified below to roll the aeroplane from a steady 30° banked turn through an angle of 60° so as to reverse the direction of the turn in not more than 11 seconds. In this demonstration the rudder may be used to the extent necessary to minimise sideslip. The demonstration should be made rolling the aeroplane in either direction, and the manoeuvre may be unchecked.

Conditions:   Airspeed  $V_2$   
                  Wing-flaps. In each take-off position.  
                  Landing Gear. Retracted.  
                  Power. The critical engine inoperative and its propeller (if applicable) in the minimum drag condition; the remaining engines operating at maximum take-off power.  
                  Trim. The aeroplane should be in trim, or as nearly as possible in trim, for straight flight in these conditions, and the trimming controls should not be moved during the manoeuvre.

What is the proposed action?: The proposed action is to harmonize the requirements by adding the additional JAR requirement to the FAR. The word “peak” would be removed under this proposal in reference to the roll rate that must be available. The FTHWG considers the use of the word “peak” to be too constraining and unclear. For example, would demonstrating an average roll rate capability be acceptable for showing compliance with a requirement for a peak roll rate? And is a peak roll rate the maximum sustainable roll rate, or a short transient condition that results from unique or unusual piloting techniques?

The words, “for climb, cruise, descent, and landing approach” would also be removed. This requirement would apply to all flight conditions, so there is no need to list them individually. The flight conditions listed in the existing JAR requirement do not include takeoff, yet it is apparent that the takeoff condition is to be considered, since the means of compliance given in the JAR guidance material are for the takeoff condition.

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What should the harmonized standard be?: see below

Proposed text of harmonized standard:

FAR/JAR 25.147(d): *Lateral control; roll capability.* With the critical engine inoperative, roll response must allow normal maneuvers. Lateral control must be sufficient, at the speeds likely to be used with one engine inoperative, to provide a roll rate necessary for safety without excessive control forces or travel.

How does this proposed standard address the underlying safety issue?: It harmonizes the FAR and JAR by adding the JAR requirement to the FAR. The FAR would then

## RPR # ANM-00-226-A

prescribe roll rate requirements in the same manner as the current JAR.

Relative to the current FAR, does the proposed standard increase, decrease, or maintain the same level of safety? Explain: It increases the level of safety because it adds a requirement that is not currently in the FAR.

Relative to current industry practice, does the proposed standard increase, decrease, or maintain the same level of safety? Explain: It maintains the same level of safety since current industry practice is to comply with both standards.

What other options have been considered and why were they not selected?: This item was proposed as an enveloping item. No other options were considered.

Who would be affected by the proposed change?: Manufacturers of transport category airplanes would be affected by the rule change.

To ensure harmonization, what current advisory material (e.g., ACJ, AMJ, AC, policy letters) needs to be included in the rule text or preamble?: None. Although very specific guidance is provided in the current ACJ for demonstrating compliance with the rule, it only represents one acceptable means of compliance. There may be other means of demonstrating compliance with the requirement. This point will be emphasized in the proposed revisions to this guidance material.

Is existing FAA advisory material adequate? (If not, what advisory material should be adopted?): The existing JAA ACJ is adequate, but will need to be reformatted for inclusion into FAA AC 25-7A. Also, there is a concern the way that maximum takeoff weight and most aft c.g. position are stated separately in the test procedures paragraph. The concern is that it could be interpreted to mean that both the maximum takeoff weight and the most aft c.g. positions must be demonstrated if these parameters do not coincide. It is intended that the most critical condition of maximum takeoff weight and aft c.g. position be demonstrated. The FTHWG did not propose changing the wording, however, in order to maintain consistency with the guidance material for the rest of § 25.147. Instead, the FTHWG recommends that the FAA adopt consistent wording for the weight and c.g. conditions called out in the guidance material for each of the §§ 25.145 and 25.147 requirements. The FTHWG recommends that wording similar to "Most critical combination of [takeoff, landing, as applicable] weight and c.g. position" be used.

Proposed advisory material: (AC 25-7A)

### 22. DIRECTIONAL AND LATERAL CONTROL - § 25.147.

#### a. Explanation.

(1) .....

## RPR # ANM-00-226-A

(2) Sections 25.147(c) and (e) require an airplane to be easily controllable with the critical engine(s) inoperative. Section 25.147(d) further requires that an adequate roll rate be provided, without excessive control forces or travel, at the speeds likely to be used with one engine inoperative. Compliance with § 25.147(d) can normally be demonstrated in the takeoff configuration at  $V_2$  speed, because this is the one-engine-inoperative condition that is usually the most critical from a roll rate standpoint. Normal operation of a yaw stability augmentation system (SAS) should be considered in accordance with normal operating procedures. Roll response with all engines operating, § 25.147(e), should be satisfactory for takeoff, approach, landing, and high speed configurations. Any permissible configuration that could affect roll response should be evaluated.

b. Procedures. The following test procedures outline an acceptable means for demonstrating compliance with § 25.147.

(1) Directional Control - General, § 25.147(a).

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(2) Directional Control - Four or More Engines, § 25.147(b).

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(3) Lateral Control - General, § 25.147(c).

(i) Configuration:

(A) Maximum takeoff weight.

(B) Most aft c.g. position.

(C) Wing flaps in the most favorable climb position.

(D) Landing gear retracted and extended.

(E) Yaw SAS on, and off if applicable.

(F) Operating engine(s) at maximum continuous power.

(G) The inoperative engine that would be most critical for controllability, with the propeller feathered, if applicable.

(ii) Test Procedure: With the airplane trimmed at  $1.4 V_S$ , turns with a bank

## RPR # ANM-00-226-A

angle of 20 degrees should be demonstrated with and against the inoperative engine from a steady climb at  $1.4 V_{S1}$ . It should not take exceptional piloting skill to make smooth, predictable turns.

(4) Lateral Control – Roll Capability, § 25.147(d).

(i) *Configuration:*

(A) *Maximum takeoff weight.*

(B) *Most aft c.g. position.*

(C) *Wing flaps in the most critical take-off position.*

(D) *Landing gear retracted.*

(E) *Yaw SAS on, and off, if applicable.*

(F) *Operating engine(s) at maximum take-off power.*

(G) *The inoperative engine that would be most critical for controllability, with the propeller feathered, if applicable.*

(ii) *Test Procedure: With the airplane in trim, or as nearly as possible in trim, for straight flight at  $V_2$ , establish a steady 30° banked turn. It should be demonstrated that the airplane can be rolled to a 30° bank angle in the other direction in not more than 11 seconds. In this demonstration, the rudder may be used to the extent necessary to minimize sideslip. The demonstration should be made in the most adverse direction. The maneuver may be unchecked. Care should be taken to prevent excessive sideslip and bank angle during the recovery.*

(54) Lateral Control - Four or More Engines, § 25.147(d).

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(65) Lateral Control - All Engines Operating, § 25.147(e).

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How does the proposed standard compare to the current ICAO standards?: The ICAO standards are very general in this area such that neither adoption nor rejection of the proposed standard will have any affect on compliance with the ICAO standards.



## **RPR # ANM-00-226-A**

Does the proposed standard affect other harmonization working groups?: No.

What is the cost impact of complying with the proposed standard?: The cost of complying is negligible for the following reasons. For applicants already conducting JAA certifications, there are no additional costs. For other applicants, additional costs of compliance are possible (less than ½ hour of flight testing and 20 hours of data analysis).

Does the working group want to review the draft NPRM prior to publication in the Federal Register?: Yes

In light of the information provided in this report, does the HWG consider that the “Fast Track” process is appropriate for this rulemaking project, or is the project too complex or controversial for the Fast Track Process. Explain: Yes, the “Fast Track” process is appropriate for this project. The project is neither too complex nor too controversial to use the “Fast Track” process.

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# RPR # ANM-00-226-A

## ARAC WG Report

### Report from the Flight Test Harmonization Working Group

#### Rule Section: FAR/JAR 25.161(c)(2)

What is the underlying safety issue addressed by the FAR/JAR?: Section/JAR 25.161 requires that transport category airplanes maintain longitudinal, lateral, and directional trim under certain conditions of flight. The capability to trim out control forces is both a pilot workload and a flight path precision issue. An out-of-trim airplane can be fatiguing to fly and it is more difficult to maintain the desired flight path.

Section/JAR 25.161(c)(2) specifies conditions under which longitudinal trim must be maintained.

What are the current FAR and JAR standards?: see below

Current FAR text: Section 25.161(c)(2): A glide with power off at a speed not more than  $1.4 V_{SI}$ , with the landing gear extended, the wing flaps (i) retracted and (ii) extended, the most unfavorable center of gravity position approved for landing with the maximum landing weight, and with the most unfavorable center of gravity position approved for landing regardless of weight; and

Current JAR text: JAR 25.161(c)(2): Either a glide with power off at a speed not more than  $1.4 V_{SI}$ , or an approach within the normal range of approach speeds appropriate to the weight and configuration with power settings corresponding to a 3° glidepath, whichever is the most severe, with the landing gear extended, the wing flaps (i) retracted and (ii) extended, the most unfavourable centre of gravity position approved for landing with the maximum landing weight, and with the most unfavourable centre of gravity position approved for landing regardless of weight; and

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What are the differences in the standards and what do these differences result in?: In addition to the power-off glide condition specified by the FAR, the JAR requires longitudinal trim to be maintained at speeds and power settings appropriate to an approach on a 3 degree glidepath. For airplanes where this condition is more stringent than the power-off glide condition, a design difference may result. Also, additional flight testing must be performed to demonstrate compliance.

What, if any, are the differences in the means of compliance?: Except for the means of compliance associated with the differences in the standards, the means of compliance are the same.

What is the proposed action?: Harmonize to the more stringent JAR standard. The

## RPR # ANM-00-226-A

phrase, “the most unfavourable centre of gravity position approved for landing with the maximum landing weight” has been removed. This phrase is unnecessary because compliance must also be demonstrated at the “most unfavorable center of gravity position approved for landing regardless of weight.” The original CAR 4b rule referenced “the most forward” center of gravity position in each instance, so it is conceivable that the first case could have been more critical at that time.

What should the harmonized standard be?: see below

Proposed text of harmonized standard:

FAR/JAR 25.161(c)(2): Either a glide with power off at a speed not more than  $1.4 V_{SI}$ , or an approach within the normal range of approach speeds appropriate to the weight and configuration with power settings corresponding to a  $3^\circ$  glidepath, whichever is the most severe, with the landing gear extended, the wing flaps (i) retracted and (ii) extended, and with the most unfavorable center of gravity position approved for landing regardless of weight; and

How does this proposed standard address the underlying safety issue?: It continues to address the underlying safety issue in the same manner, but adds a requirement to ensure that transport category airplanes maintain longitudinal trim in a power-on approach condition.

Relative to the current FAR, does the proposed standard increase, decrease, or maintain the same level of safety?: It increases the level of safety for those transport category airplanes for which the power-on approach condition is more critical for maintaining longitudinal trim than the power-off glide condition.

Relative to current industry practice, does the proposed standard increase, decrease, or maintain the same level of safety?: It maintains the current level of safety since industry practice is to comply with both the FAR and the JAR.

What other options have been considered and why were they not selected?: This item was proposed as an enveloping item. No other options were considered.

Who would be affected by the proposed change?: Manufacturers and operators of transport category airplanes could be affected by the proposed change.

To ensure harmonization, what current advisory material (e.g., ACJ, AMJ, AC, policy letters) needs to be included in the rule text or preamble?: None.

Is existing FAA advisory material adequate? (If not, what advisory material should be adopted?): There is no specific advisory material for either the JAR or the FAR, so there is not a harmonization issue. Developing new harmonized advisory material appears to be unnecessary and probably would not fit within the fast track schedule.

## **RPR # ANM-00-226-A**

How does the proposed standard compare to the current ICAO standards?: The proposed standards are consistent with, but more detailed than the ICAO standards.

Does the proposed standard affect other harmonization working groups?: No.

What is the cost impact of complying with the proposed standard?: The cost of complying is negligible for the following reasons. For applicants already conducting JAA certifications, there are no additional costs. For other applicants, additional costs of compliance are possible (less than ½ hour of flight testing and 20 hours of data analysis).

Does the working group want to review the draft NPRM prior to publication in the Federal Register?: Yes.

In light of the information provided in this report, does the HWG consider that the “Fast Track” process is appropriate for this rulemaking project, or is the project too complex or controversial for the Fast Track Process. Explain: Yes, the “Fast Track” process is appropriate for this project. The project is neither too complex nor too controversial to use the “Fast Track” process.

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# RPR # ANM-00-226-A

## ARAC WG Report

### Report from the Flight Test Harmonization Working Group

#### Rule Section: FAR/JAR 25.175(d)

What is the underlying safety issue addressed by the FAR/JAR?: Section/JAR 25.175 contains the conditions under which static longitudinal stability must be demonstrated for transport category airplanes. Static longitudinal stability is required by part 25 for the following reasons:

- Provides additional speed change cues to the pilot through control force changes.
- Ensures that short periods of unattended operation do not result in any significant changes in attitude, airspeed, or load factor.
- Provides predictable pitch response.
- Provides acceptable level of pilot attention (workload) to attain and maintain trim speed and altitude.
- Provides gust stability.

What are the current FAR and JAR standards?: see below

Current FAR text: *Landing*. The stick force curve must have a stable slope, and the stick force may not exceed 80 pounds, at speeds between  $1.1 V_{S0}$  and  $1.8 V_{S0}$  with--

- (1) Wing flaps in the landing position;
- (2) Landing gear extended;
- (3) Maximum landing weight;
- (4) Power or thrust off on the engines; and
- (5) The airplane trimmed at  $1.4 V_{S0}$  with power or thrust off.

Current JAR text: *Landing*. The stick force curve must have a stable slope, and the stick force may not exceed 80 pounds, at speeds between  $1.1 V_{S0}$  and  $1.8 V_{S0}$  with--

- (1) Wing flaps in the landing position;
- (2) Landing gear extended;
- (3) Maximum landing weight;
- (4) The aeroplane trimmed at  $1.4 V_{S0}$  with --
  - (i) Power or thrust off, and
  - (ii) Power or thrust for level flight.

What are the differences in the standards and what do these differences result in?: The JAR standard requires the stick force criteria to be met at the power or thrust for level flight in addition to the FAR condition of power or thrust off. This additional condition

## RPR # ANM-00-226-A

requires additional flight test demonstrations to show compliance and may have an influence on the design of airplanes for which the application of power has a significant destabilizing effect.

What, if any, are the differences in the means of compliance?: Except for the additional power-on condition required by the JAR, there are no differences in the means of compliance.

What is the proposed action?: Harmonize to the more stringent JAR standard.

What should the harmonized standard be?: see below

Proposed text of harmonized standard:

FAR/JAR 25.175(d): Landing. The stick force curve must have a stable slope, and the stick force may not exceed 80 pounds, at speeds between  $1.1 V_{SO}$  and  $1.8 V_{SO}$  with-

- (1) Wing flaps in the landing position;
- (2) Landing gear extended;
- (3) Maximum landing weight;
- (4) The airplane trimmed at  $1.4 V_{SO}$  with –
  - (i) Power or thrust off, and
  - (ii) Power or thrust for level flight.

How does this proposed standard address the underlying safety issue?: It continues to address the underlying safety issue in the same manner, but adds a requirement to ensure that transport category airplanes have adequate static longitudinal stability in a power-on approach condition.

Relative to the current FAR, does the proposed standard increase, decrease, or maintain the same level of safety?: It increases the level of safety for those transport category airplanes for which the power-on condition is more critical in terms of static longitudinal stability than the power-off condition.

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Relative to current industry practice, does the proposed standard increase, decrease, or maintain the same level of safety?: It maintains the current level of safety since industry practice is to comply with both the FAR and the JAR.

What other options have been considered and why were they not selected?: Harmonizing to the FAR standard was considered; however, there are normally occurring situations for which level flight in the landing configuration may be relevant. These situations include stepdown fixes on nonprecision approaches and extending the flaps and landing gear to the landing configuration when the glide slope becomes active on a precision approach, but before the glide slope intercept point.

## RPR # ANM-00-226-A

Who would be affected by the proposed change?: Manufacturers and operators of transport category airplanes could be affected by the proposed change.

To ensure harmonization, what current advisory material (e.g., ACJ, AMJ, AC, policy letters) needs to be included in the rule text or preamble?: None.

Is existing FAA advisory material adequate? (If not, what advisory material should be adopted?): The existing advisory material is adequate.

How does the proposed standard compare to the current ICAO standards?: The proposed standards are consistent with, but more detailed than the ICAO standards.

Does the proposed standard affect other harmonization working groups?: No.

What is the cost impact of complying with the proposed standard?: The cost of complying is negligible for the following reasons. For applicants already conducting JAA certifications, there are no additional costs. For other applicants, additional costs of compliance are possible (less than ½ hour of flight testing and 20 hours of data analysis).

Does the working group want to review the draft NPRM prior to publication in the Federal Register?: Yes.

In light of the information provided in this report, does the HWG consider that the “Fast Track” process is appropriate for this rulemaking project, or is the project too complex or controversial for the Fast Track Process. Explain: Yes, the “Fast Track” process is appropriate for this project. The project is neither too complex nor too controversial to use the “Fast Track” process.

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